COS 2

VIRTUAL ANALOG SYNTHESIZER

Operation manual

sur-audio lab® 2012

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COS2

virtual analog
synthesizer

user manual

Introduction

Congratulations on choosing the new COS2!

The Sur-audio Lab team

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Specifications

Voices: 16

3 sound generators:
2 multi wave oscillators with standard wave shapes (saw, pulse, triangle, sine)
1 wavetable oscillator with 63 different tables.
The multi oscillators can be arranged for the classic Sync function or for Frequency Modulation (FM) type of synthesis.

Unison mode:
Every voice is produced by several detuned oscillators.

Morph function:
Every pot of the panel can be modulated by 4 controllers in parallel. These are: Velocity, Keyboard note, Pressure (aftertouch), Modulation wheel. The Modulation wheel can be replaced by any other midi controller.

Envelope generators: 2 ADSRs envelopes.
Both envelopes are sources in the MODULATION section.

LFO's: 2 multi-wave Lfo' s with rate, depth.
6 waveforms to choose (sin-square-saw up-saw down-triangle-random), key-retrigger, fade-in, fade-out, phase, delay

Filters: One 24db Vintage Lowpass filter and one 12dB Multimode filter.

Sounds:
127 presets.

System requirements:
Compatible with any Sonic-Core DSP system hardware and software.
Minimum requirements: 3 DSP' s.

Device Setup

> Move *COS2.dev* in your devices folder.
(c:\program files\SCOPE\devices\)

> Move *COS2.pre* file in your preset files folder
(c:\program files\SCOPE\presets\)

> Use Live bar menu or drag the device
from the File browser into the Project window
and connect *midi in* and audio *outputs* as needed.

Panel

LFOs (page 15)

Preset changing and Settings (pages 8, 10)

Amplifier & Filter envelopes (page 16)

Midi-in indicator

Preset List (page 8)

Morph function (page 11)

Modulation section (page 17)

Global settings (pages 9-10)

Oscillators (pages 12-13)

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Preset List handling

COS2 synthesizer uses preset lists for storing sounds.
> Open the preset browser with the dedicated button at the upper right corner.

SELECTING PROGRAMS

COS2 has one bank, containing 128 programs numbered from 0 to 127.

To try out some sounds, there are three basic methods of selection:

Sequentially

The most obvious way to select programs is by stepping through them using the buttons to the center of the display next to the preset name.

Via the Preset browser

Another way to choose programs is by selecting them through the preset browser.

Via MIDI

All MIDI sequencers and professional MIDI keyboards are capable of transmitting Bank and Program change messages via MIDI.

CREATING NEW SOUNDS

The INIT Program

The first preset has been reserved for a simple template, which you can use whenever you want to create sounds “from scratch”.

COMPARE

This button recalls the initial state of the selected preset.

Panel reference - Global

PORTA
> Off, Portamento to Fing. Gliss.: The PORTA text field sets the type of portamento or glissando (or set inactive).

PITCH BEND RANGE
> Off, 1 to 24: PB text field sets the amount of pitch bend in semitones (or set inactive).

MONO
> Off, On: This button selects whether the entire sound is polyphonic or monophonic.

UNISON VOICES
Unison means several instances of the same note detuned against each other at the same time. The trade-off is a reduction in polyphony.
> Off, 2 to 16: Number of voices used for each note.
If set to Off, no Unison parameters will be visible

CHANNEL
> 1 to 16, omni: Specifies the MIDI channel used

COARSE (semitone)
> -64 to +64: Coarse control over the pitch of the entire COS2.

FINE (cent)
> -99 to +99: Fine control over the pitch of the entire COS2.
A cent is one hundredth of a semitone.

PANORAMA
> -12 to +12: The position of the signal across the stereo outputs. Modulation destination “PAN“.

VOLUME
> 0 to +12: The overall gain of the sound.

UNISON DETUNE
> 0 to +12: The amount of detuning between instances of the same note.
For UNISON DETUNE to have any effect, the number of stacked (layered) voices must be greater than 1. (“UNISON VOICES”)

Panel reference - Global

GLOBAL SETTINGS

Settings

This menu is opened by pressing the SETTINGS button to the right of the top display.
It contains a few global parameters.

REPLACE MOD WHEEL

> Off, On. Set to On...

> 2 to 119 ...and the selected Midi Controller will be used as a Morph source instead of the Modulation wheel.

MORPH CONTROLLER

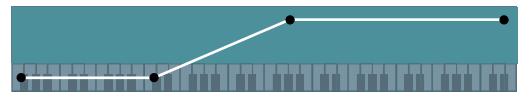
> 2 to 119: Default (CC63). The Midi controller that will act as the Morph assigning switch.

Tip The Sustain pedal uses CC64 (Midi continuous controller) by default. This is permanently connected to the envelopes. So instead of direct control, it is handy to specify a different controller here (e.g. CC63), in order to allow the control of the Morph Switch with the Foot Pedal without actually sending Sustain messages.*

Tip Set this value to “CC64-HOLD PEDAL” for direct use. If that is the case sustained notes will occur normally if midi notes are triggered during the morph assigning.

KEY FOLLOW CURVE

This button will open a panel to set the desired curve for the Key Follow action.



* A *Midi Transformer* should be used in the Sequencer between the physical device and the sequencer midi-in so to transform CC64 to CC63 or to any other.

Panel reference - Morph function

Morph function is a process for modulating any pot of the COS2 panel by four modulators. These are Velocity, Keyboard Note, Channel Pressure (aftertouch) and Mod Wheel.

To activate the process, there are two basic methods:

Via any Midi controller or Foot pedal

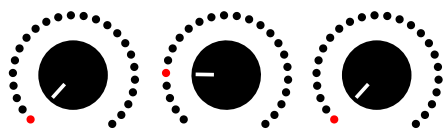
The Sustain Pedal or any other midi controller can be used as the Morph Switch. (For details see page 10 “MORPH CONTROLLER”).

Via the button *Set* Set

Use that button if you have no access to Midi pedals.

To assign a morph range proceed as follows:

> Press the Foot pedal or turn on the *Set* button. Rotate one or more pots to the desired value(s). Please do not change the Morph source during range assigning.



> Release the Sustain pedal or set the button *Set* to off position.

Morph reset Init

> To deactivate a specific range press the X button right to any assigned pot.

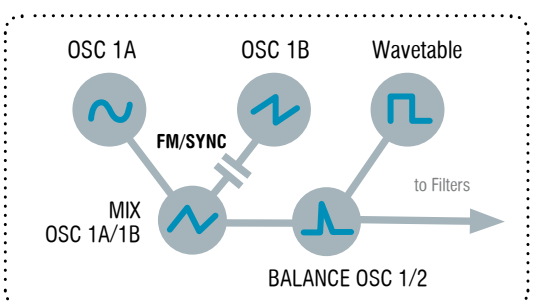
> To reset all the morph ranges, press the *Init* button on the top of the Morph section.

Tip Pressing the *Init* button regains DSP memory.

Panel reference - Oscillators

COS2 has three oscillators, two Multi-wave oscillators and one Wavetable oscillator.
To change the waveshapes use the text fields on the top of the oscillator section.

Below is a small schematic of the oscillators internal structure.



DET2
> 0Hz to +12 semitones: This is the knob for tuning oscillator 1B.

SHAPE
> 0 to 12: Oscillator 1 Shape control.

	Normal	FM on	Sync on
Shape function	Pulse Width if pulses are selected	FM index (amount)	Sync amount (Osc1B pitch)

In other case, the Shape pot is not accessible

MIX
> 1 to 2: This knob controls the relative mix of oscillators 1A and 1B.

BAL1/2
> 1 to 2: This knob controls the relative mix of oscillators 1 and 2 while keeping the total level constant. The 12 o' clock position is a 50:50 mix of both these oscillators.

TUNE2
> -48 to +48: Use these fields to adjust the pitch of oscillator 2 over a range of -48 to +48 semitones.

> -99 to +99: Use these fields to adjust the pitch of oscillator 2 over a range of -99 to +99 cent.

SHAPE2
> 0 to 12: Oscillator 2 Wavetable Index. Controls the Index parameter–the nominal position within the table.

Panel reference - Oscillators

GAIN
> 0 to 12: This is a volume control for all three oscillators before the filter.

PORTAMENTO (TIME)
> 0 to 12: Often called glide. Portamento is particularly effective in mono mode (see “MONO” on page 9).

Tip If the number of UNISON NOTES equals the number of COS2 assigned voices then the patch is in effect “big mono”.

SYNC
> Off, On: When this function is active, Osc 1A is synchronized to Osc 1B. Use the SHAPE parameter to alter syncronization rate. Look up Sync in the glossary if necessary.

FM
> Off, On: FM stands for Frequency Modulation. This means that the frequency of one audio source (Osc 1A) is modulated by another (Osc 1B) with amount determined with the SHAPE parameter.
As well as being able to create bell-like tones, FM is often used to add grit to a sound.

SYNC and FM functions are mutualy exclusive.

Panel reference - Filters

The COS2 has two filters that can be configured in series or parallel. Filter 1 has four poles (24dB per octave) and simulates the classic Minimoog™ low pass (including it' s typical selfoscillation). Filter 2 has two poles (12dB per octave). This adds up to a total of six poles i.e. 36dB per octave if BAL1/2 is centre (+0).

CUTOFF
> 0 to 12: The cutoff frequency of filter 1.

RES
> 0 to 12: The resonance of filter 1.

ENV
> 0 to 12: Controls how much the Envelope 2 affects Cutoff1 – like automating the CUTOFF knob with each and every note you play.

CUTOFF2
> 0 to 12: The cutoff frequency of filter 2.

RES2
> 0 to 12: The resonance of filter 2.

BAL1/2
> 1 to 2: Filter 1/2 balance. The relative contribution of the two filters. At 1 you can only hear the output of filter 1. In the central position (0), both filters contribute equally. At 2 you can only hear the output of filter 2.

SER/PAR
> Serial: The filters are routed in series.
> Parallel: The filters are routed in parallel.

FILTER2 (TYPE SELECTOR)
Using the FILTER2 button, you can set filter 2 to one of following types:
> LP=Low Pass: Allows frequencies below the cutoff point to pass through i.e rejects those above the cutoff point.
> HP=High Pass: Allows frequencies above the cutoff point to pass through i.e. rejects those below the cutoff point.
> BP=Band Pass: Allows frequencies close to the cutoff point to pass through.

To modulate filter 2 with an envelope or another modulator use the MODULATION section.

Panel reference - Lfos

There are two LFOs in COS2, and each one can modulate directly any or all destinations of the modulation section. Each one offers 6 waves to choose (sine-square-saw up-saw down-triangle-random). To change the wave type click on the waveform representation. To route the Lfos use the MODULATION section. All parameters for LFO1 are the same as those for LFO2.

RATE
> 0 to 12: The speed of LFO.

DEPTH
> 0 to 12: How much the LFO modulates the Target parameter.

TYPE
> Sine, Triangle, SawUp, SawDown, Square, Random: The LFO waveform.

KEY (Retrigger On/Off)
> Off, On: When set to Off, LFO runs freely i.e. its phase is not reset by every note played. When activated, the starting point within the wave will retrigger at the Phase position.

FADE-IN
> 0 to 3 seconds: The time the modulation will gradually build to maximum.

FADE-OUT
> 0 to 3 seconds: The time the modulation will gradually fade to silence after key release.

PHASE
> -180º to 180º: Determines the position within the waveform (phase) at which the signal will start when a key note is received. KEY retrigger must be enabled for this to take effect.

PRE-DELAY
> 0 to 3 seconds: Delays the onset of the modulation.

Panel reference - Envelopes

There are two ADSR envelopes in COS2.
The first controls the overall sound level.
The other controls Filter 1 Cutoff frequency via the Filters ENV pot. Both are sources in the MODULATION section.
They have abjustable Velocity sensitivity and abjustable curves for the Decay and Release slopes. All parameters for Envelope 1 are the same as those for Envelope 2.

ATTACK
> 0 to 12: The time it takes for the filter envelope to rise from 0 to maximum.

DECAY
> 0 to 12: The time it takes to fall from maximum to the Sustain level.

SUSTAIN
> 0 to 12: The level of sustained notes after the Decay.

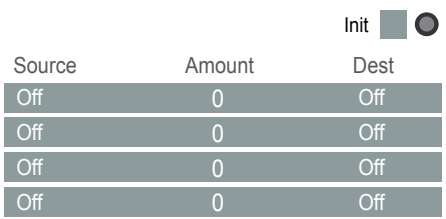
RELEASE
> 0 to 12: the time it takes to fade out after notes are released.

ENVELOPE VELOCITY SENSITIVITY
> 0 to 127: How much the envelope responds to keyboard velocity.

ENVELOPE 2 POLARITY
> Invert, on/off: When that button is lit envelope 2 effect is inverted.

Panel reference - Modulation

COS2 has a small dedicated section for modulation. Here is where the modulators are routed to several parameters. Available sources are the envelopes, the LFOs, as well as the Pitchbend wheel.



SOURCE
> Off, LFO1 ... Pitch Bend: Specifies the modulation source (Envelopes, LFOs, Pichbend wheel).

AMOUNT
> -63 to +63: Modulation amount for the specified destination. The range is bipolar so that modulation can be inverted.

DESTINATION
> Off, Osc1 Pitch ... Pan: Specifies the modulation destination.

Modulation matrix reset

> To quickly reset all the values, press the *Init* button on the top of the modulation section.

COS2XTC

Features:
- Total recall. All plug-in settings are saved with the song.

Cons:
- Latency is in general longer
- no Routing Window

SYSTEM REQUIREMENTS
The COS2 VST plug-in is available for the Windows PC platform (as VSTi in XTC mode).
There are no specific system requirements:
COS2 should run within any professional host program.

INSTALLATION
Simply run the setup program and follow instructions.

Appendix A - Glossary

Most of the terms below only apply to synthesizer technology.

A

- Aftertouch
Term for Channel Pressure
- Attenuation
Reduction of amplitude.

B

- Balance
Simultaneous control over the relative levels of two signals. (cross-fade).

C

- CC
MIDI continuous controller number. Several of these numbers have been specified e.g. Modulation wheel=CC01. The list of sources in the COS2 Morph modulator selector includes an extensive list of these (2-119).
- Channel Pressure
Monophonic aftertouch. MIDI data caused by pressing harder on the keyboard after playing notes.
- Continuous Controller
See CC.
- Cross-fade
The mix of two successive sounds in such a way that they appear to blend smoothly from one to the next.
- Cutoff
Threshold frequency of a filter above and/or below which frequencies are attenuated or boosted. Resonance accentuates frequencies close to the cutoff point.

D

- dB (Decibel)
Relative unit of attenuation or gain.
- DSP
Digital Signal Processor.

E

- Envelope
Synthesizer module originally used to simulate the way a note appears and fades out. Can also be used for many other purposes (e.g. filter cutoff, pitch).

F

- Filter
Module present in all subtractive synthesizers used to pass certain frequencies while rejecting/attenuating others.
- FM
Frequency Modulation (e.g. FM synthesis). Pitch modulation when the source and destination are both audio signals, resulting in a compex tone.
- Frequency
Speed of oscillation.

G

- Glide
See Portamento.

H

- Hertz (Hz)
Measurement of frequency.

K

- Key Follow
Modulation source proportional to the MIDI note number i.e. which key you play.
- Key Pressure
See Polypressure.

L

- LFO (Low Frequency Oscillator).
Generally used as a cyclic modulation source.

M

- MIDI
Acronym for Musical Instrument Digital Interface. The standard protocol used for communication between electronic musical instruments and computers.
- Modulation Wheel
General-purpose performance control. Often used for controlling vibrato depth.
- Monophonic (Mono)
Only one note can be played at a time e.g. flute. See Polyphonic.

O

- Octave
A musical interval 12 semitones apart e.g. C3 to C4.

P

- Panorama (Pan)
The position of an audio signal in a stereo field i.e. the left/right volume ratio.
- Parallel
Routing term: Not connected one after the other (see Serial), but alongside each other.
- Phase
The position within one cycle of a wave. Measured in degrees, whereby 360° is the end of the cycle.
- Pitch
Frequency (e.g. how low/high a note is). Pitch is mainly used for musical notes, while frequency is the more scientific term.
- Pitchbend
MIDI data usually derived from the sprung wheel (stick) to the left of a MIDI keyboard.
- Pole
Units of -6dB per octave gain attenuation in filters.
- Polyphonic, Poly
When several notes can be played at the same time. See Monophonic.
- Portamento
Classical term for gliding pitch from one note to the next. Often called glide.
- Preset
Often used as a synonym for patch, sound, program etc.
- Pulse wave
Oscillator waveform alternating between two discrete levels.
- Pulse Width
The ratio between the lengths of the upper and lower levels in a pulse wave.

R

- Random
Something that happens without regularity.
- Resonance
Boosting of frequencies close to the cutoff point in a filter (via feedback).

S

- Semitone
Pitch interval equal to one twelvth of an Octave. The keys on a keyboard are a semitone apart.
- Serial (in series)
Routing term. The signal is sent to one module (e.g. a filter), which in turn sends its output to another module (e.g. another filter). See also Parallel.
- Slave
Module which is following parameters set by another module.
In the COS2, oscillator 1-B is optionally a slave of oscillator 1-A.
- Square wave
Special form of Pulse wave in which the Pulse Width is exactly 50%.
- Subtractive synthesis
The method of creating sounds by removing frequencies from complex waveforms.
- Sync
Synchronization. In oscillator sync, one oscillator resets the phase of another.

U

- Unison
Several instances of the same note at the same time.

V

- Vibrato
Cyclic pitch bend (usually around 5Hz).
- Voice
A complete sound-generation unit (oscillator, filter, envelope, LFOs etc.). A monophonic synthesizer has only one voice. Unison mode uses 2 or more voices per note.

X

- XTC mode
Special SCOPE hardware utilization mode that uses SCOPE devices inside the host sequencer.

Appendix B - Patch Names

1. Enseble Strings ..... Strings
2. Bright Keys ..... SynthKeys
3. Sync Key ..... SynthKeys
4. Psy arp ..... Technosyn
5. Fat Detuned..... SynthHit
6. Fat & Grit ..... SynthBass
7. Bright Pad..... BrightPad
8. Big Syncer ..... HardLead
9. Big Mono ..... SynthHit
10. Fat Synth..... HardLead
11. Hoover Pad..... AtmoPad
12. Vocal Synth..... TechnoSyn
13. Pulse Setback ..... TechncSyn
14. Long Steps .....Keyboard
15. Electro Piano 1.....ElPiano
16. Slow Pad .....MotionPad
17. Meta Violin..... SoloStr
18. Bells .....Bell
19. Starman..... AtmoPad
20. Hard Fm Lead ..... HardLead
21. Big Pulse ..... TechnoBass
22. Grit ..... HardLead
23. Self Reso .....SynthFX
24. Clavichord..... Clavinet
25. Sub Bend.....ElBass
26. Fat Glide..... HardLead
27. Bell Keys.....Keyboard
28. Deep Sub.....ElBass
29. Lfo Pad..... BrightPad
30. Sweep Strings..... Strings
31. Psy Fall.....SynthFX
32. Pulsing.....SoftLead
33. Saturn Storm.....SoundFX
34. Astronaut.....SynthFX
35. Dramatic Enseble ..... Strings
36. Fat Pitch Sweep .....SynthFX
37. Bells Fx Detune .....SynthFX
38. PWM Pad..... BrightPad
39. Fat Sync..... HardLead
40. Fat Pulse..... SynthKeys
41. Unidentified.....SynthFX
42. Sweep Pad..... SoftPad
43. Robo Lead ..... TechnoSyn
44. Hoover String..... Strings
45. Unison Sync ..... HardLead
46. Techno 2 ..... TechnoSyn
47. Enseble Keys .....Keyboard
48. Triangle Sync .....SoftLead
49. Cosmic Pad ..... SoftPad
50. Snap Bass .....SynthBass
51. Pulse Keys.....Keyboard
52. Fat Pulse..... SynthBass
53. Leader ..... HardLead
54. Hard Filter mod ..... HardLead
55. Psy Sweep.....SynthFX
56. Dark Fx Pad..... DarkPad
57. Sorrow Pad..... SoftPad
58. Pulse Enseble ..... Strings
59. Treble Box.....Keyboard
60. Wacky Cpu .....SynthFX
61. Falling Fx.....SynthFX
62. Humans Friend.....SynthFX
63. Just Uni ..... TechnoSyn
64. Pitcher .....SynthFX
65. Fat Synth..... HardLead
66. Space Machine .....SynthFX
67. PW Filtered ..... HardLead
68. Industrial Drone.. SynthDrone
69. Chaos Core.....SynthFX
70. Hoover Drone..... SynthDrone
71. Smooth Keys ..... SynthKeys
72. Big Uni Sync ..... TechnoSyn
73. Computing .....SynthFX
74. Noisy Sweep.....SynthFX
75. Psy Pulse.....SynthFX
76. Vibrato Pad .....MotionPad
77. Electro Piano 2.....ElPiano
78. Pad Detune .....MotionPad
79. Fm Sweep.....SynthFX
80. Sync Lead..... HardLead
81. Fm MW.....SynthFX
82. Reso Harm..... SynthKeys
83. Trill fx.....SynthFX
84. Hard Bass..... SynthBass
85. Snap Bass ..... SynthBass
86. Hard Lead ..... HardLead
87. Duo Bass..... SynthBass
88. Fm Patch .....SoundFX
89. Yeah .....SynthFX
90. Pulsing..... HardLead
91. Psy seq MW ..... Sequencer
92. Wind Key ..... SynthKeys
93. Old arcade game.....SynthFX
94. Blender Fx.....SynthFX
95. Glide Seq ..... Sequencer
96. Fm Reverser .....SynthFX
97. Bright Synth ..... BrightPad
98. Sweeping Uni..... SynthKeys
99. Filter Seq..... Sequencer
100. Chords.....Keyboard
101. Galactic Radio.....SynthFX
102. Syncer 2 ..... TechnoSyn
103. Hypnotizing Bell .....Bell
104. Bubble Filter.....SoftLead
105. Electric Viola ..... SoloStr
106. Deep Kick ..... ElDrums
107. High Harm ..... SynthDrone
108. Syncy Seq..... Sequencer
109. Soft Keys .....Keyboard
110. PWM ..... TechnoSyn
111. Filter Mod.....SynthFX
112. Space Station.....SynthFX
113. Portamento Fx.....SynthFX
114. Twitter Key.....Keyboard
115. Neptune ..... Strings
116. Simple Arp ..... Arpeggio
117. Random Velo ..... Arpeggio
118. Fat Organ ..... Organ
119. Saw Unison ..... SynthKeys
120. Gated Organ ..... Organ
121. Lfo Filter..... SynthBass
122. Velo Pan ..... Sequencer
123. Psy Bend .....SynthFX
124. Retrigger LFO.....SynthFX
125. Vibrato Synth .....Keyboard
126. Soft Sync .....SoftLead
127. Traditional car horn ..SoundFX

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COS2

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